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Pesticide Fact Sheet Number 14.1: Fensulfothion

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This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

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Pesticide Fact Sheet

Name of Chemical: FENSULFOTHION
Reason for Issuance: REGISTRATION STANDARD AMENDMENT
Date Issued: Feb. 28, 1985
Fact Sheet Number: 14.1

1. Description of chemical

Generic name: 0,0-diethyl O-[p-(methylsulfinyl) phenyl] phosphorothioate
Common name: fensulfothion
Trade names: Dasanit, BAY 25141, S-767, TERRACUR P
EPA Shaughnessy code: 032701-5
Chemical abstracts service (CAS) number: 115-90-2
Year of initial registration: 1965
Pesticide type: insecticide-nematicide
U.S. and foreign producer: MOBAY Chemical Corporation

2. Use Patterns and Formulations

Fensulfothion is registered for use as preplant or at-planting soil application to tobacco, and various fruits and vegetables. Postplant topical applications are permitted in addition to the at-planting application on corn, peanuts, and rutabagas. Topical application is also permitted on commercial and ornamental turf.

Fensulfothion is formulated into a 63% (6lb/gallon) E.C.(restricted use), and 10% and 15% granulars, and at various percentages with disulfoton, thiram, or pebulate.

3. Science Findings

Summary science statement: Fensulfothion is an organophosphate insecticide-nematicide of high toxicity to man and other non-target terrestrial and aquatic organisms. Tier III data (field studies) have been requested in response to the three RPAR triggers (mammalian, avian, and aquatic) that have been exceeded. The current NOEL, ADI, and MPI are now only partially supported by data, but will be used in the interim. Available data are insufficient to fully assess the toxicology of fensulfothion, its fate in the environment, or the exposure of humans and non-target organisms to the chemical or its degradates.

Chemical Characteristics: Technical fensulfothion is a brown liquid organophosphate, stable under normal use conditions, with a boiling point of 138-141°C at 0.01 mm Hg. It is soluble in most organic solvents except aliphatics. The chemical is acutely toxic and extreme caution is necessary in handling of contaminated articles and during mixing, loading, and application. Respirator and protective clothing are required during these operations.

Toxicoloxical Characteristics:

Fensulfothion is highly toxic (Tox. Category I) from acute oral and dermal routes of exposure.

Science Findings (continued)

Toxicoloxical Characteristics (continued):

Many of the toxicology studies do not meet present guideline requirements and need to be replaced, however no significant risks have been identified from the existing data base.
Toxicology studies on fensulfothion are as follows:

- Oral LD_{50} in rats: 2.2 mg/kg (female), 10.5 mg/kg (male) [Acceptable]
- Dermal LD_{50} in rats: 3.5 mg/kg (female), 30.0 mg/kg (male) [Acceptable]
- Acute delayed neurotoxicity in chickens: none observed [Supplementary]
- Metabolism study in rats: [Acceptable]
- 90 Day feeding-rodent; non-rodent: [Supplementary; Invalid - data gap]
- Chronic toxicity, non-rodent: [Invalid - data gap]
- Chronic toxicity, rodent: No NOEL found [Supplementary]
- Oncogenicty, rat: [Supplementary]
- Teratogenicity, rabbit: [Supplementary]
- Reproduction study: NOEL 1 or 4 ppm [Supplementary]
- Mutagenicity, gene mutation: Negative [Partially satisfied study]

Physiological and Biological Characteristics

Fensulfothion is an organophosphate insecticide-nematicide that kills primarily by contact action but also provides some systemic control of insects attacking the foliage of treated plants.

The mode of action is by phosphorylating the acetylcholinesterase enzyme of tissues, allowing accumulation of acetylcholine at nerve junctions with subsequent blocking effects upon the central nervous system.

The metabolism of fensulfothion is basically similar in both plants and animals. By the processes of hydrolysis, oxidation and reduction the parent compound may be broken down to 13 known metabolites, 5 of which are themselves cholinesterase inhibitors. On the basis of this knowledge, all presently established fensulfothion tolerances are expressed in terms of the combined residues of the parent compound and these five cholinesterase inhibiting metabolites. Fensulfothion is metabolized fairly rapidily by both plants and animals. In animals, hydrolytic degradation in liver and other tissues results in excretion of low toxicity degradation products, with half the pesticide eliminated within 24 hours and almost total elimination of the pesticide and its metabolites within a week.

Environmental Characteristics:

Fensulfothion is degraded in soils under aerobic conditions with half-lives of 3-28 days and is due to microbial degradation. Half-life is rapid in silty clay loam and organic soil (3-7 days) and fairly rapid in sandy loam, silt loam and loam soils (around 28 days). Fensulfothion degrades rapidly in the water and silt of a simulated pond with half-lives of 10 and 12 days, respectively.

The mobility of fensulfothion and aged residues is low to moderate in a wide range of soils. Dissipation of fensulfothion is fairly rapid from field soils with half-lives ranging from <30 days to >182 days.

3. Science Findings (continued)

Environmental Characteristics (continued):

Fensulfothion residues are taken up by rotational crops grown in the greenhouse but are not taken up by field rotational crops.

Available data are insufficient to fully assess the fate of fensulfothion in the environment; however, ground water contamination does not appear to be a problem with this chemical.

Fensulfothion has a low potential to bioaccumulate in bluegill sunfish.

Data are insufficient to fully assess the exposure of humans and non-target organisms to the chemical or its degradates, however, human exposure should be minimal by use of current restricted use classification and labeling precautions requiring approved respirators and protective clothing.

Exposure during reentry operations should be minimal, however, data are not available to fully assess such exposures. A 7 day reentry period is being required for unprotected workers following soil application if the soil is wet. A 24 hour reentry period is being required for applications of fensulfothion where agricultural practice will involve hand labor with prolonged, intimate foliar contact, or if the soil is dry.

Ecological Characteristics:

Avian oral LD_{50}: 0.749 ppm (very high toxicity)
Avian dietary LC_{50}: 22 ppm (high toxicity)
Fish LC_{50}: 0.07 ppm (very high toxicity)

The toxicity of fensulfothion to terrestrial and aquatic non-target organisms is very high. Residue calculations indicate that 3 RPAR triggers (mammalian, avian, and aquatic) may be exceeded. In all cases the Standard has asked for Tier III data (field studies) to gather qualitative and quantitative data to support the registration and/or need for special review.

Because of fensulfothion's extensive number of use patterns and its high toxicity to wildlife, numerous endangered species have been identified that could be impacted. The Agency is currently considering various approaches to address the problem for this and other chemicals, and the Standard may be amended to incorporate the results of this additional review.

Science Findings (continued)

Tolerance assessment:

The following tolerances (in parts per million) have been established for fensulfothion:

Commodity	United States	Canada	Mexico	International (Codex)
Bananas	0.02	-	-	0.02
Beets, sugar	0.05	-	-	-
Beets, sugar, tops	0.05	-	-	-
Cattle, fat	0.02	-	-	0.02
Cattle, MBYP	0.02	-	-	0.02
Cattle, meat	0.02	-	-	0.02
Corn, field, fodder	1.0	-	-	-
Corn, field, forage	1.0	-	-	-
Corn, fresh (inc. sweet) (K+CWHR)	0.1	0.1	-	0.1
Corn, grain	0.1	0.1	-	0.1
Corn, pop, fodder	1.0	-	-	-
Corn, pop, forage	1.0	-	-	-
Corn pop, grain	0.1	0.1	-	0.1
Corn, sweet, fodder	1.0	-	-	-
Corn, sweet, forage	1.0	-	-	-
Cotton, seed	0.02	-	-	-
Goats, fat	0.02	-	-	0.02
Goats, MBYP	0.02	-	-	0.02
Goats, meat	0.02	-	-	0.02
Hogs, fat	0.02	-	-	-
Hogs, MBYP	0.02	-	-	-
Hogs, meat	0.02	-	-	-
Horses, fat	0.02	-	-	-
Horses, MBYP	0.02	-	-	-
Horses, meat	0.02	-	-	-
Onions, dry bulb	0.1	0.1	-	0.1
Peanuts	0.05	-	-	0.05
Peanuts, hulls	5.0	-	-	-
Pineapples	0.05	-	-	0.05
Pineapples, forage	0.05	-	-	-
Plantains	0.02	-	-	-
Potatoes	0.1	0.1	-	0.1
Rutabagas, roots	0.1	0.1	-	0.1
Sheep, fat	0.02	-	-	0.02
Sheep, MBYP	0.02	-	-	0.02
Sheep, meat	0.02	-	-	0.02
Sorghum, fodder	1.0	-	-	-
Sorghum, forage	1.0	-	-	-
Sorghum, grain	0.1	-	-	-
Soybeans	0.02	-	-	-
Soybeans, forage	0.1	-	-	-
Sugarcane	0.02	-	-	-
Sweet potatoes	0.05	-	-	-
Tomatoes	0.1	-	-	0.1

3. Science Findings (continued)

Tolerance assessment (continued):

Most tolerances for residues are supported with data, however, additional data must be submitted to support tolerances for residues in or on the following commodities: bananas, peanuts, peanut hulls, plantain, and potatoes (processing data only).

There is no reasonable expectation of finite residues in milk, eggs, poultry meat, fat, or meat by-products and no tolerances are required.

Reported pesticide incidents involving fensulfothion alone between 1966 and 1983 include 25 involving human injury and 4 involving animals. Most of the human incidents resulted from failure to use safety equipment while applying fensulfothion. Other incidents were the result of improper disposal, handling, or storage. Because the incidents involve occasions of misuse, no additional precautionary statements are necessary at this time to minimize the risk of injury.

4. Summary of Regulatory Position and Rationale

° The previous "Restricted Use" classifications required in 40 CFR §162.31 will be continued. In addition, granular formulations are now being restricted All granular formulation products released fro shipment after September 1, 1985 must be labeled for restricted use. Also, all products still in channels of trade after September 1, 1986 must be labeled for restricted use.

° The following Environmental Hazards text will be required on manufacturing use products because of the hazards posed to non-target terrestrial and aquatic wildlife:

"This product is toxic to fish and extremely toxic to wildlife. Do not discharge into lakes, streams, ponds, or public waters unless in accordance with an NPDES permit. For guidance, contact your Regional Office of the EPA."

° The following environmental statements are required for end-use products:

"This product is toxic to fish and extremely toxic to wildlife. Use with care when applying in areas frequented by wildlife. Birds feeding on treated areas may be killed. Cover, disc, or incorporate spill areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not apply directly to water or wetlands. Do not contaminate water by cleaning of equipment or disposal of wastes. This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area."

° The following reentry precautions are required on end-use products in the interim until requested reentry data has been received and reviewed by the Agency:

"Unprotected workers should not re-enter treated fields until 24 hours after application. Unprotected workers should not re-enter fields where

the soil is wet until 7 days after soil application."

Summary of Major Data Gaps

	Due Date
° Product Chemistry	
- Description of manufacturing process	6/84
- Description of formation of impurities	6/84
- Preliminary analysis	6/84
- Certification of limits	6/84
- Odor	6/84
- Solubility	6/84
- Vapor pressure	6/84
- Dissociation constant	6/84
- Octanol/water partition coefficient	6/84
- pH	6/84
- Analytical method for enforcement of limits	6/84
- Oxidizing or reducing action	6/84
- Flamability	6/84
- Explodability	6/84
- Viscosity	6/84
- Miscibility	
° Residue Chemistry	
- Storage stability	1/87
- Processed food/feed studies on potatoes	1/87
- Crop field trials on bananas, peanuts, and plantain	1/87
° Toxicology	
- Inhalation LC_{50} - rat	6/84
- Acute delayed neurotoxicity - hen	6/84
- 90-Day feeding - rodent, non-rodent	1/87
- 90-Day inhalation - rat	1/87
- Chronic toxicity - 2 species	1/87
- Oncogenic study - 2 species	1/87
- Teratogenicity - 2 species	1/87
- Reproduction - 2 generation	1/87
- Gene mutation	1/87
- Chromosomal aberration	
° Wildlife and Aquatic Organisms	
- Avian reproduction	1/87
- Simulated and actual field testing (mammals and birds)	1/87
- Acute LC_{50} freshwater invertebrates	1/87
- Acute LC_{50} estuarine and marine organisms (shrimp, marine fish, and oyster)	1/87
- Fish early life stage and aquatic invertebrate life-cycle	1/87
• Environmental Fate	
- Hydrolysis	1/87
- Photodegradation in water	1/87
- Anaerobic soil metabolism	1/87
- Volatility	1/87
- Soil dissipation	1/87
- Accumulation in rotational crops	1/87
- Accumulation in fish	

- Reentry Protection
  - Foliar dissipation 1/87
  - Soil dissipation 1/87
  - Dermal exposure 1/87
  - Inhalation exposure 1/87

6. Contact person at EPA:

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DISCLAIMER: The information presented in this Chemical Information Fact Sheet is for informational purposes only and may not be used to fulfill data requirements for pesticide registration and reregistration.